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ABSTRACT

The potential educational impact of the Melbourne Zoo (Australia) for recreational visitors was examined in this study using time as the major dependent variable. Specific goals included: (1) assessment of the potential cognitive and affective educational impact of zoos on recreational visitors; (2) determination of the temporal and spatial patterns of the zoo visitors; and (3) improvement of the utility of nonreactive research methods. Data were collected on traffic density patterns, on observations of 18 groups of visitors during their entire visit to the zoo, observations at 18 specific exhibits, and from questionnaires (N=550) on visitors' feelings about 11 exhibits. Comparisons are made with the results of other zoo studies. The mean time of visits at the Melbourne zoo was 160 minutes, averaging 126 minutes walking among exhibits. It was recommended that both survey and nonreactive research methods be used in combination to cross-validate information on zoo studies. (ML)

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VISITOR BEHAVIOR AT MELBOURNE ZOO*

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ABSTRACT

The potential educational impact of Melbourne Zoo for recreational visitors was assessed using time as the major dependent variable. First, traffic density throughout the zoo was established to provide a broad picture of visitor use of the facility. Second, 18 randomly selected groups of visitors were followed for their entire visit to determine how long they spent in the zoo and how they distributed their time among the exhibits, eating, shopping, and other activities. Third, over 5000 groups of visitors were observed to assess predetermined behavior at 18 specific exhibits. Fourth, 550 questionnaires were completed to assess visitor feelings about 11 selected exhibits. Taken together, the measures provide a complete picture of the recreational zoo visitor in Melbourne, and the basis for comparisons with identical data from other zoos which may lead to even more general conclusions.

ACKNOWLEDGMENTS

This study would not have been possible without the cooperation and assistance of many people. Among them, four were crucial. When I approached Gaye Hamilton with the idea for the study in 1984, she obtained the approval of the Zoological Board of Victoria with the speed and enthusiasm necessary to arrange a leave from my teaching duties, and on my arrival assisted in many crucial ways. Bob Wagner's support was crucial in obtaining additional funds to support the work. Norman Dowsett provided a place to live and many interesting conversations. Cathleen Cox of the Los Angeles Zoo suggested several methodological refinements without becoming responsible for any shortcomings that remain.

INTRODUCTION

Purposes

The study had three major purposes. The first was to assess the potential educational impact--both cognitive and affective--of zoos on recreational visitors. The second was to determine the temporal and spatial patterns associated with their visits, and to identify areas of the zoo seldom reached by visitors. The third was to improve the utility of nonreactive research methods.

The study is part of a larger effort, at this point involving Antwerp, Los Angeles, and Singapore zoos, aimed at making comparisons among instead of merely within institutions and thus providing the basis for more general conclusions about visitors.

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* Paper presented at the 1987 meeting of the American Association of Zoological Parks and Aquariums, Portland, Oregon.

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Definition of Terms

Abusive behavior includes-- and is limited to--feeding, throwing objects into enclosures, teasing, and verbal abuse. Typical teasing behavior includes offering but not actually feeding animals or tapping on enclosure glass. Typical verbal abuse includes behavior such as shouting intended to get a reaction from an animal and derogatory remarks about the animal intended for group members.

Affective learning refers to the qualities attributed to specific animal enclosures on four bipolar scales: pleasant-unpleasant, exciting-gloomy, arousing-sleepy, and relaxing-distressing.

Cognitive learning consists of factual knowledge about animals such as identification of species, knowledge of their distribution in the wild, habitats or behavior patterns which in the zoo may be learned either by reading exhibit labels or by viewing animals in enclosures.

Nonreactive measures are methods of collecting data which do not change the behavior of the subjects that is being measured.

Recreational visitors are paying members of the public spending a portion of the day at the zoo.

Spatial patterns describes actual routes followed by visitors through the zoo.

Temporal patterns describes how recreational visitors divide total time spent at the zoo among walking and viewing exhibits, eating, shopping, and other activities.

Assumptions

The major assumption of this study is that time spent at a zoo is positively correlated with learning. It originates in the findings of the International Study of (Mathematics) Educational Achievement (1969) and has led to the "Time on Task" model (Fisher and Berliner, 1985), which treats time allotted to study of a topic as an opportunity to learn (See Figure 1), some proportion of which students actually will be engaged in some form of learning, though not necessarily that intended. Some proportion of allotted time will be related time, but not all of this will be engaged time because students may not be interested in the subject or the learning activities. Finally, students will enjoy varying levels of success in achieving intended outcomes. The task of the curriculum designer is to maximize the darkened area represented by the overlap of highly successful, relevant, and engaged time. This can be accomplished by identifying relevant, controllable, variables and ignoring others (even if more important) which are difficult to or beyond control. An example of the latter is family income, which is highly correlated with academic achievement, but is not easily changed by educators.

At some risk of being Procrustean, the model is applicable to zoos. Allotted time is interpreted as the total time a group spends at the zoo, and could be increased by inducing visitors to come more often,

to spend more time at the zoo when they do come, or both. Coe (1985) suggests that this requires understanding and fulfilling visitor needs, while Falk (1982) has found that total visit costs (entry, souvenir, food, and transportation including parking) are major factors in visit frequency and duration.

Related time is interpreted as the time visitors actually spend learning about animals or related topics such as ecology. Opportunities to increase it are limited only by the imagination: special events, improving zoo guides and maps, printing food containers with animal quizzes and games.

Engaged time is interpreted as the time visitors are interested and involved with exhibits. Coe (1985) suggests this requires emotional involvement while De Borhegyi (1964) suggests planned variation. Bitgood (1985) found it is affected by visitor density and social interaction among them, and Hoppes (1986) argues for interactive labels. Recorded sounds, touch tables, and keeper lectures all have been successful in various guises.

Successful time refers to the degree educational objectives are achieved. Coe (1985) suggests that people are more disposed to learn from or about animals if they are looking up at them, encounter them by surprise, are in a novel setting such as a nocturnal house, are surrounded or outnumbered by the animals or are close to them. Both De Borhegyi (1964) and Cheek and Brennan (1976) argue that zoos should provide adequate frameworks to assist visitors to understand exhibits, which in turn implies that design must include take account of feasible educational goals from the beginning. Bacon and Hallett (1981) and Rand (1986) argue that label reading will increase if labels sometimes are provocative, sometimes are whimsical, always are brief and use rhetorical devices to attract and hold visitors.

The Time on Task model provides a framework for interpreting much of the literature on exhibit design, a guide for improving educational aspects of exhibit design, and a rationale for the use of time as an indirect measure of how much is learned from exhibits.

Limitation

The most important limitation is that the methods cannot determine what visitors learn from zoos, even if they do provide a better idea of how much visitors learn.

METHODS

The four techniques used to collect data are described below in turn. Three of the four are nonreactive. I have spoken elsewhere of both the desirability and the limitation of these methods (Churchman, 1985). The main virtue is that subjects do not change their behavior or respond to please researchers, so that validity is enhanced. The main difficulty is analyzing and interpreting data in terms of the research questions. Such methods often involve ethical questions, but those described below are acceptable by U.S. standards because they are confined to observation of public behavior in public places.

Density and Direction of Visitor Traffic

The density and direction of visitors was determined by counting the number of people going in each direction on each section of each path in the zoo for for fifteen minutes. The idea may be likened to taking aerial photographs of the zoo to determine how heavily travelled each section is. In practice, and with only one person to collect the data, the counts were taken between 1100 and 1300 on several weekends. Thus, the data provide a rough idea of where visitors concentrate during the most heavily attended portion of the day. The data also provide the means for assessing the applicability to the study of zoo visitors of several statistics developed by geographers to study the relationship of traffic and road nets.

Temporal and Spatial Patterns of Recreational Visitors

Randomly selected visitor groups were followed without their knowledge for their entire stay at the zoo. The route they followed was marked on a zoo map, and their location noted every 10 minutes. The method is aimed at determining how much time people spend at the zoo, how many exhibits are viewed in a typical visit, and how they allocate total time among (1) walking and viewing exhibits, (2) eating, (3) shopping, and (4) other activities. In combination with the density data described above, it is possible to determine whether there are parts of the zoo that visitors seldom reach, whether there are common routes that people take, and whether there are points at which efforts to influence routes might be particularly effective.

Exhibit Observations

Visitors at specific exhibits were counted and timed for three one-hour periods (1000-1100, 1200-1300, and 1400-1500) to determine time spent at each, whether group size or direction of approach (associated with the route taken and thus with probable level of fatigue) affected this time. Also noted were whether photos (still, move, or video) were made and whether visitors engaged in any of four categories of abusive behavior. Combined with the estimates of number of exhibits visited and time spent walking among exhibits, this data completes the picture provided of the typical recreational zoo visit.

In selecting exhibits for observation, the first constraint was time, which limited data collection to 18 exhibits. The second constraint was the intent to test Bitgood's (unpublished) hypothesis that visitors seeing similar exhibits in succession will spend less and less time at each. These constraints limited data collection to the first, middle, and last exhibits in six areas where similar exhibits were grouped. To prevent difficulty in interpreting data, it also was desirable to select single species enclosures of varied types, and as widely scattered through the zoo as possible. The exhibits that best met all these criteria are presented in Table 1, and their locations within the zoo are presented in Figure 4.

The arboreal primates are in tall, natural exhibits enclosed on three sides and the top with wire mesh, and on the fourth side by a wooden wall with a glass viewing panel at about the level of the lowest

tree branches; "Top Six" (slated for replacement) consists of steel-barred concrete-floored cages. The big cats are in wire fenced cages scattered with ledges, logs and the like; the small cats are in similar but much smaller cages. The reptiles are behind glass in a darkened building. The ungulates are in large fenced grass enclosures.

Affective Qualities of Exhibits

Russell (1980) proposed a geometrical representation of the affective qualities of places (see Figure 2) and developed an instrument to measure them. His instructions were followed for developing alternative 20-item forms and these were used to obtain a comparative rating of selected zoo exhibits (See Table 1). As the instrument was designed to discriminate among such places as beaches and bars, the first question is if the method is sufficiently powerful to discriminate the much finer differences among enclosure types.

Data was collected at 11 exhibits indicated in Table 1. These represent one enclosure from each of the six areas in which observation data was collected, and five additional enclosures selected to represent as wide a variety of exhibit types.

"Bushland" permits visitors to walk through an area of free-roaming animals, many tame enough to be approached and even petted. The Butterfly House is a greenhouse which visitors walk through among free-flying butterflies. The maned wolves almost never came out of a den box toward the rear of a large grassed area (the exhibit already was slated for replacement). The platypus swam behind glass that permitted visitors to watch it above or below water from a darkened room much like a cave.

RESULTS

Density and Direction of Visitor Traffic

Figure 3 presents the number of people moving in each direction on each sector of each path through the zoo at midday. Traffic across the hatched areas is not point-to-point so was not counted. The classic "right-turn bias" first reported by Melton (1935, 1972) is apparent both at the main and rail entrances. The heaviest traffic follows the zoo perimeter, including Top Six, Big Cats, Ungulates, the Walkthrough Aviary, Butterflies, Arboreal Primates and Great Apes. Much of the traffic through the Ungulate area originates in the approximately 20% of visitors who use the rail entrance. The only heavily travelled central area is the diagonal between the lions and giraffes which also takes in the reptiles and platypus.

Temporal and Spatial Patterns

Eighteen randomly selected visitor groups were followed for their entire stay at the zoo. In two cases, contact was lost accidentally, and in one case contact was broken off when the visitors realized they were being followed.

Demographics of the groups tracked, and their allocation of time to major activities within the zoo, are shown in Table 2. The category "other" includes activities such as restrooms, entertainment area (carnival rides and games), resting, and the gymnasium area (swings and climbing equipment).

The actual route taken by each group was recorded on a zoo map, and their location noted every ten minutes. Figure 4 summarizes this information in the form of an "idealized" route that may be interpreted as a prediction of the route and pace a visitor entering the main gate is likely to take. The tendency of visitors to follow the perimeter again shows up, as does the diagonal between the lions and giraffe.

Three points, marked A, B, and C, indicate points at which efforts to influence visitor routes are likely to have the greatest effect. The most obvious is point A, the main entrance, where about 75% of the 80% of all zoo visitors who use this entrance turn right to follow the relatively dreary path toward "Top Six," rather than down the wide and very beautiful path into the center of the zoo. Alternatively, it could be argued from the limited success in changing visitor turning behavior (Melton, 1935, 1972) that the "Top Six" area should have the highest priority for improvement.

At Point B visitors make a choice between continuing along the perimeter or turning into the center of the zoo. Whichever choice a group makes here make severely reduces the likelihood they will take the other during their visit.

Point C represents the confluence of many routes and is the point in the zoo which visitors are likely to come through several times. Therefore, it is the second most important point at which to try to influence groups to see parts of the zoo they have not yet visited.

Thus, it appears that efforts concentrated at only two points among the eighty or so where visitors make choices about their route may have a major influence on spatial patterns.

Exhibit Observations

Observation of visitors to the 18 exhibits listed in Table 1 was conducted from 1000 to 1100, from 1200 to 1300, and from 1400 to 1500 for one day each. The direction from which each group approached the exhibit, the size of the group, the time of arrival and departure (in minutes and seconds), whether or not the visitors photographed the exhibit (still, movie, or video), whether they exhibited any of four types of abusive behavior defined above, and the activity level of the animals all were recorded. 5022 visitor groups, representing over 15,000 visitors, were observed.

Table 3 presents the results for each of the exhibits. Bitgood, et. al. (unpublished) hypothesized that visitors seeing similar exhibits in succession will spend less and less time at each. At each of the six groups of three exhibits observed, the hypothesis predicts whether visitors groups arriving from the right will spend more time, equal time, or less time than visitor groups arriving from the left. Further,

the hypothesis suggests that median times spent at three successive exhibits should decline. Tables 4 and 5 test these predictions. The predicted results occur in only 14 of the 40 tests, insufficient to support the hypothesis.

Table 6 presents data on other visitor activities at the 18 exhibits. The number of photographs is assumed to provide an index of relative popularity of animals. Animal abuse does not appear to be a serious problem at Melbourne Zoo.

Finally, the observational data makes it possible to determine how visitors are distributed by group size. To avoid counting the same group twice, the data from one exhibit per day on six separate weekend days was tallied (See Table 7). Approximately two-thirds were in family-size groups of 2, 3, or 4 people; mean size was 3.07 people.

Affective Properties of Exhibits

Unfortunately, analysis of the questionnaires was not completed in time to present today. The best that can be said at this point is that results appear to cluster in the first quadrant of Russell's model (that is, along a vector pointing toward "exciting" representing relatively high ratings on the "arousing" and "pleasant" dimensions. There seems to be little little distinction among exhibits.

CONCLUSION

Generalizations about Zoo Visitors

The study provides a concise and comprehensive summary of how long visitors spend at Melbourne Zoo, their activities while there, what parts of the zoo they do and do not visit, and how much time they spend at individual exhibits. Such information may be useful to the Melbourne staff but is not useful elsewhere unless generalizations from it are possible. The literature contains numerous other studies along the same lines--but there are so many obvious differences, in methodology and institutional characteristics to name only two important ones, that it is difficult if not impossible to generalize from it.

The obvious alternative is to collect the same data by the same methods at several comparable zoos in as short a time as possible. The current study is one of four conducted at zoos on as many continents. This may not be sufficient, particularly because variables are nested by cultural factors, but it is a beginning in overcoming the difficulty of reaching generalizations about zoo visitors.

To preview these comparisons, mean time was 160 minutes at Melbourne, 168 minutes at Los Angeles, and 156 minutes at Singapore (the Antwerp data is not yet in). Visitors to Melbourne averaged 126 minutes walking among exhibits, those to Los Angeles averaged an almost identical 127 minutes, and those to Singapore averaged 106 minutes. It should not surprise anyone familiar with the facilities at these three zoos that Melbourne visitors spend more time eating; Los Angeles visitors spend more time shopping; and Singapore visitors spend more time in "other" activities--specifically, at the animal shows.

Research Methods Pertaining to the Study of Zoo Visitors

Nonreactive methods have several advantages in studying zoo visitors. For example, tracking provides more comprehensive and valid information than departure surveys on how long visitors stayed, what they saw, and how often they fed or abused animals. One of the major reasons for concentrating on nonreactive methods in the current study is is that they are language-independent, so avoid difficulties of translation in a multinational study!

On the other hand, nonreactive methods have several disadvantages. Most obvious, a very large number of visitors can be surveyed in the time it takes to track a single group. Generalizing from tracking data is much more subjective than it is from carefully designed questionnaires for which statistical methods are well-developed.

Thus, neither approach is sufficient alone. Survey and nonreactive methods should be used in combination, to compensate for the weaknesses and take advantages of the strengths of each and to cross-validate information where possible. In this way, the fullest possible understanding of the educational impact of zoos can be achieved.

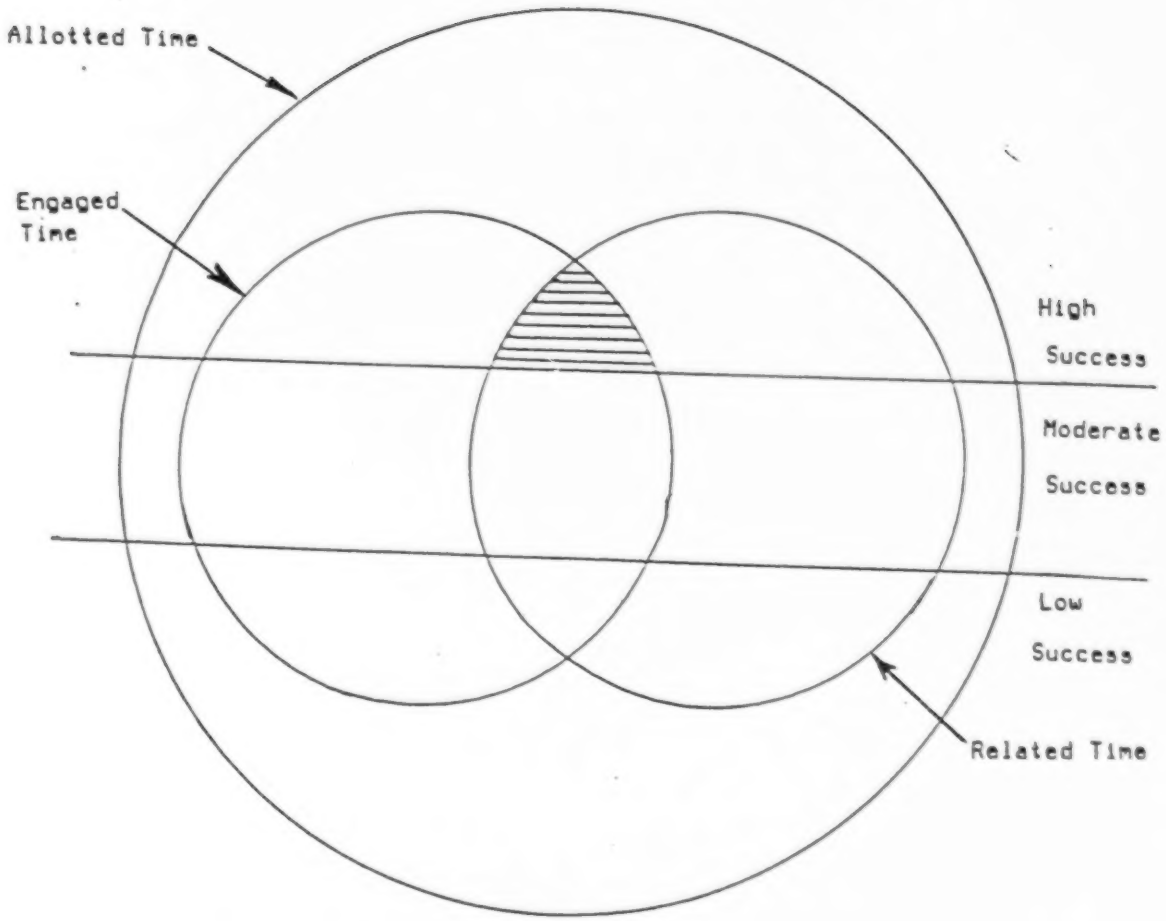

Figure 1
"Time on Task" Model

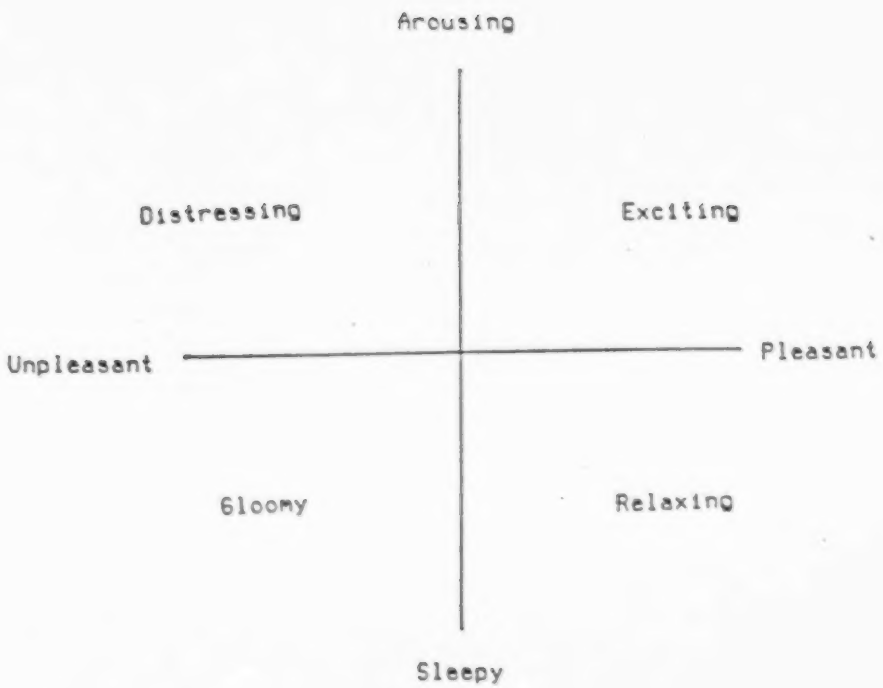

Figure 2
Russell's Model of the Affective Quality of Places

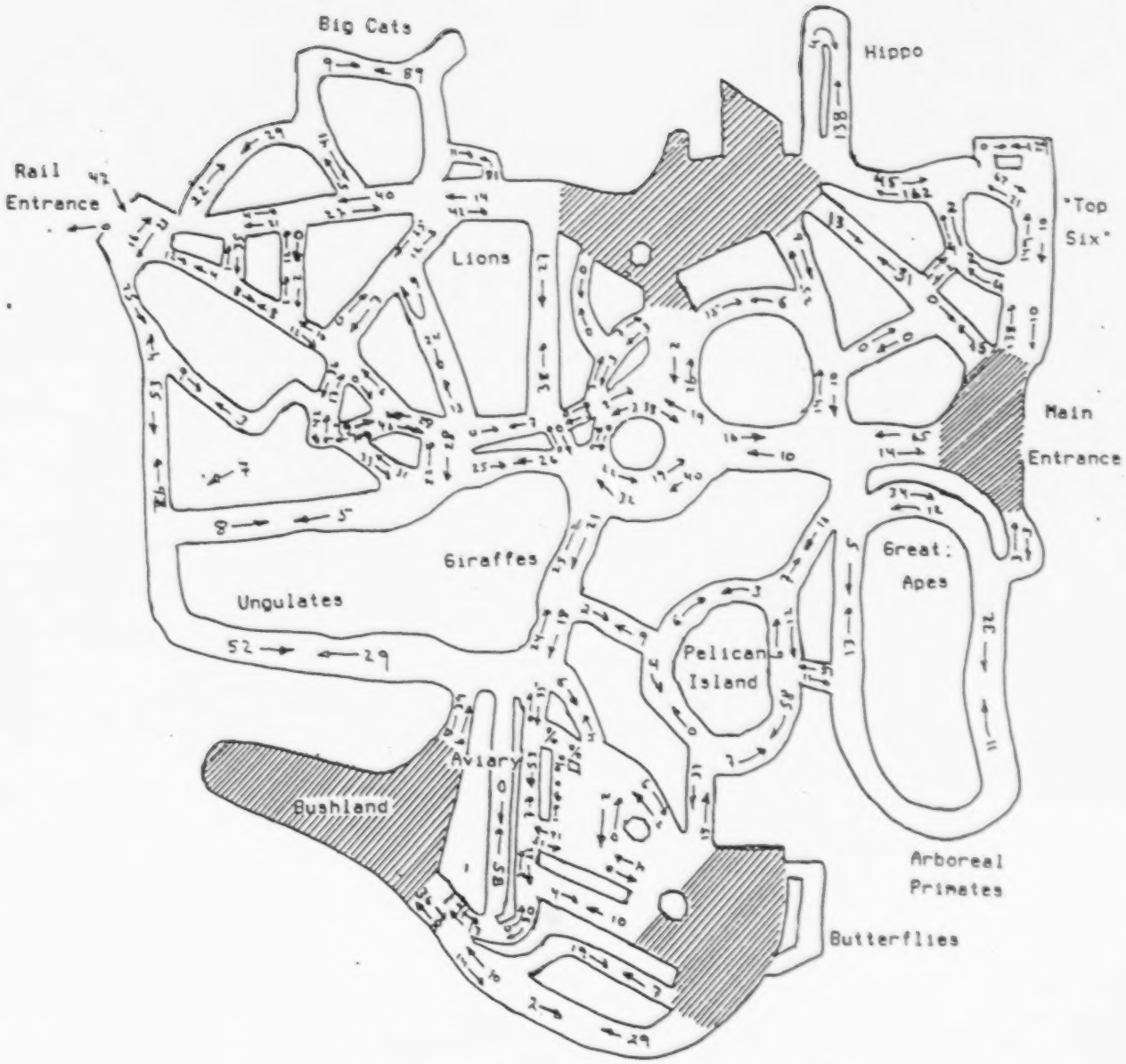

Figure 3
Density and Direction of Visitor Traffic

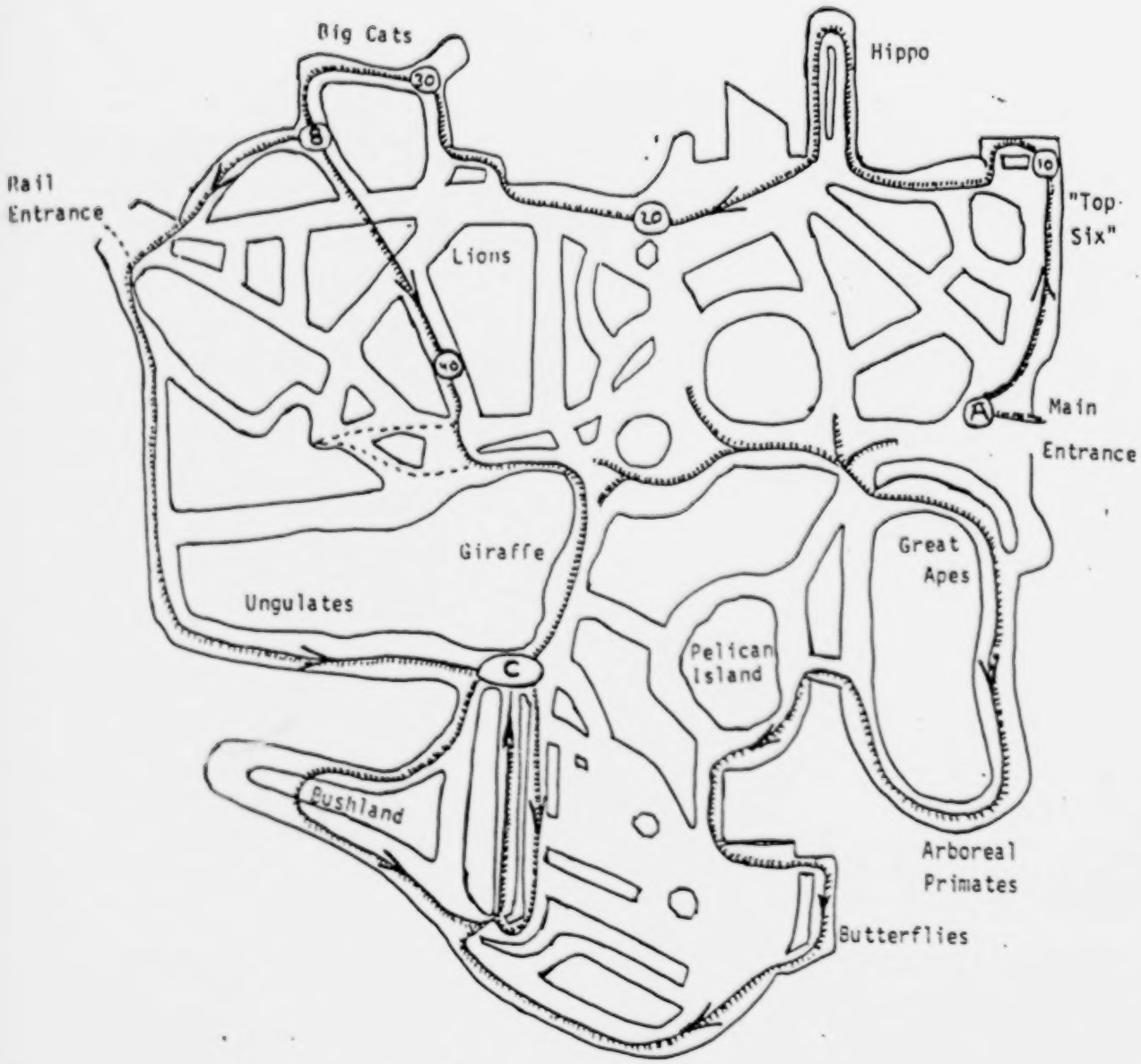

Figure 4
Generalized Spatial and Temporal Patterns of Recreational Visitors

Zoo Area and Common Name	Scientific Name	Type of Data	
		O	Q
Arboreal Primates			
Colobus	Colobus abyssinicus abyssinicus	X	
Spider monkey	Ateles geoffroy	X	X
Gibbon	Hylobates concolor leucogenys	X	X
Big Cats			
Jaguar	Panthera onca	X	X
Snow leopard	Panthera uncia	X	X
Tiger	Panthera tigris sumatrae	X	
Bushland	*		X
Butterfly house	**		X
Primates			
Capuchin	Cebus apella	X	
Hamadryas baboon	Papio hamadryas	X	X
Mandrill	Mandrillus sphinx	X	
Reptiles			
Blue-tongue lizard	Tiliqua scincoides intermedia	X	
Boa constrictor	Constrictor constrictor	X	X
Estuarine crocodile	Crocodylus poresus	X	X
Small Cats			
Bobcat	Lynx rufus	X	
Caracal	Lynx caracal	X	
Serval	Felis serval	X	X
Ungulates			
Bison, Deer	Bison bison, Odocoileus virginianus	X	
Wapiti	Cervus canadensis	X	
Zebra	Equus burchelli antiquorum	X	X
Other			
Maned wolf	Chrysoyon brachyurus		X
Platypus	Ornithorhynchus anatinus		X
Syrian bear	Ursus arctos syriacus		X

* Free-roaming Australian animals such as emu, pademolon, King Island wallaby and grey kangaroo.

** Fourteen species of butterflies at time of data collection

Table 1
Exhibits on which data were collected

Demographics	Minutes Allocated to Activities				
	Walking & Exhibits	Eating	Shopping	Other	Totals
2 adults, 2 children	104	32	4	9	149
2 adults, 1 child	108	14	0	0	122
2 adults, 3 children	113	17	0	0	131
2 adults, 3 children	124	35	4	3	166
3 adults, 2 children	106	54	10	22	192
2 adults, 3 children	76	0	0	0	76
2 adults, 3 children	115	21	10	4	145
2 adults, 3 children	183	49	0	4	236
2 adults, 1 child	127	27	0	9	163
3 adults, 2 children	204	35	6	30	275
1 adult, 2 children	100	15	0	0	115
1 adult, 3 children	137	24	0	2	161
2 adults	124	21	0	2	149
2 adults, 3 children	87	24	0	10	121
3 adults, 3 children	184	31	2	5	202
Means	126.13	26.60	2.40	6.67	160.2

Table 2
Allocation of Visitor Time Among to Selected Activities

Exhibit	Hours: 1000-1100		1200-1300		1400-1500		Combined	
	N (groups)	Median (seconds)	N (groups)	Median (seconds)	N (groups)	Median (seconds)	N (groups)	Median (seconds)
Boa constrictor	60*	19*	139	19	186	21	393	20
Bobcat	48	22	83	24	80	18	211	21
Wapiti	31	26	84	30	85	22	200	23
Serval	37	38	72	25	258	26	367	27
Tiger	53	17	133	36	121	30	307	30
Caracal	48	24	122	32	181	31	343	31
Jaguar	44	46	194	27	237	36	475	32
Snow leopard	47	28	152	32	188	38	387	34
Bison	26	36	47	36	86	38	159	37
Zebra	29	24	48	24	102	44	179	38
Mandrill	22	42	58	34	86	43	158	40
Estuarine crocodile	124*	30*	43	32	172	54	339	40
Blue-tongue lizard	33*	30*	95	62	150	32	278	42
Capuchin	25	56	69	46	103	40	197	44
Spider Monkey	27	28	88	42	131	56	238	48
Calebus	34	67	96	47	140	52	270	51
Hamadryas	73	58	81	46	96	56	250	54
Gibbon	49	124	68	73	154	64	271	84
Totals	802		1656		2564		5022	

* Exhibits open at 1030; data collected 1030-1130

Table 3
Visitor Time at Selected Exhibits, by Time of Day

Exhibit	Approach from Right		Predicted Direction	Approach from Left	
	N	Median		N	Median
Capuchin	112	68	R > L *	85	68
Hamadryas	163	58	R = L *	87	58
Mandrill	133	38	R < L *	25	48
Tiger	197	28	R > L	110	33
Jaguar	318	32	R = L *	157	28
Leopard	243	32	R < L *	144	41
Colobus	70	51	R > L	200	51
Spider Monkey	60	42	R = L	178	48
Gibbon	78	113	R < L	193	72
Zebra	77	38	R < L	102	36
Wapiti	68	22	R = L *	132	24
Bison	84	34	R > L	75	38
Serval	175	28	R < L	192	28
Caracal	169	31	R = L *	174	31
Bobcat	132	22	R > L *	79	18
Boa Constrictor	124	18	R < L *	269	23
Crocodile	76	40	R = L *	263	42
Bluetongue Lizard	135	38	R > L	153	45

Table 4
Visitor Time at Selected Exhibits, by Direction of Approach

Order in which Exhibits were Visited	Median Time at Exhibits			Result
	First	Second	Third	
Leopard-Jaguar-Tiger	41	28	33	*
Tiger-Jaguar-Leopard	28	32	32	
Mandrill-Hamadryas-Capuchin	48	58	38	
Capuchin-Hamadryas-Mandrill	68	58	38	*
Colobus-Spider Monkey-Gibbon	51	42	113	
Gibbon-Spider Monkey-Colobus	72	48	51	*
Zebra-Wapiti-Bison	36	22	38	
Bison-Wapiti-Zebra	34	24	38	
Serval-Caracal-Bobcat	28	31	18	*
Bobcat-Caracal-Serval	22	31	28	
Boa-Crocodile-Lizard	23	40	45	
Lizard-Crocodile-Boa	38	38	18	

*Results consistent with hypothesis within statistical error

Table 5
Visitor Time at Selected Exhibits, by Sequence of Visits

Exhibit	Instances of Abuse				
	Photos*	Feeding	Throwing Objects	Teasing	Verbal
Capuchin	6	4	0	0	0
Hamadryas	4	0	0	0	0
Mandrill	5	0	0	0	1
Estuarine crocodile	7	**	**	0	7
Blue-tongue lizard	7	**	**	0	15
Boa constrictor		**	**		
Sumatran tiger	21	0	0	0	5
Snow leopard	29	0	0	0	2
Jaguar	20	0	0	0	2
White-cheek gibbon	32	**	**		0
Colobus	18	**	**		0
Spider monkey	3	**	**		0
Wapiti	4	0	0	0	1
Zebra	9	0	0	0	0
Bison	11	0	0	0	0
Caracal	22	0	0	2	1
Serval	41	0	0	0	5
Bobcat	11	0	0	1	0

* Number of groups taking one or photos (still, movie, or video)
** Glass protected enclosure

Table 6
Visitor Activity at Selected Exhibits

Exhibit	Group Size (Mean = 3.07 people)										Totals
	1	2	3	4	5	6	7	8	9	10+	
Capuchin	17	76	49	32	14	4	2	0	0	1	195
Crocodile	38	134	67	55	27	7	5	1	2	1	337
Gibbon	31	104	57	44	16	15	2	1	0	4	274
Wapiti	14	64	44	49	20	17	8	3	1	6	226
Bison	16	73	35	19	5	3	3	4	2	1	161
Caracal	29	125	69	56	29	18	4	5	1	2	338
Groups	145	576	321	255	111	64	24	14	6	15	1531
Percent	9.4	37.6	20.9	16.6	7.2	4.2	1.6	.9	.4	1.0	100.0*
People	145	1152	963	1020	555	384	168	112	54	150	4703
Percent	3.1	24.5	20.5	21.7	11.8	8.2	3.6	2.4	1.2	3.2	100.0*

* Discrepancies stem from rounding

Table 7
Zoo Visitors by Group Size

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